FACTORS INFLUENCING IRISH POTATO (*Solanum tuberosun* L.) OUTPUT AMONG MALE AND FEMALE FARMERSIN JOS–SOUTH LOCAL GOVERNMENT AREA OF PLATEAU STATE, NIGERIA

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Abstract: The study assessed the factors influencing Irish Potato (*Solanum tuberosun* L.) output in Jos-South Local Government Area of Plateau State, Nigeria. The specific objectives of the study were to describe and compare the socio-economic characteristics of male and female Irish potato farmers; determine and compare the factors influencing potato output among male and female, and identify the constraints faced by male and female potato farmers. Primary data were collected through the use of questionnaires administered to 160 respondents selected randomly in proportion to the number and gender in each of the four selected districts. Both descriptive and inferential statistics were used to analyse the data. The mean age for male and female were 47 and 44 respectively. Majority of both male (77.10%) and female (77.8%) were married. Similarly, 52.80 and 56.70% of male and female respondents attained primary education. The mean farming experience for male and female were 11 and 10 years, respectively. Both had mean extension contact of 2 per annum. The result of multiple regression for male showed R^2 of 56% and education, farm size and extension contact were significant and positive, while for female the R^2 was 44% and age, household size, farm size and farming experience were significant. Some of the major constraints affecting both male and female potato farmers include diseases, low number of extension visit, high cost of inputs and pest. The study recommends that Research institutes and other relevant authorities need to intensify their efforts in addressing the problem of potato pests and diseases, which would ensure profitability among the farmers.

Keywords: Influencing, Irish potato, output, Jos-south

Introduction

World Bank (2009) reported that both male and female contribute significantly to potato production, but differ in the tasks that they perform. Land clearing, tilling of the soil and stem planting are laborious and are exclusive work usually for males and young boys (Onwukeme, 2001). Mbwika (2001) asserted that both sexes are equally represented in land preparation, planting, weeding and marketing. Male performed mainly the land preparation and planting, while female specialized in weeding, harvesting, transportation and processing (Akeredolu, 2009). World Bank (2009) confirmed that planting and weeding is a shared activity of both male and female. Harvesting is mainly women's work with more labour input especially in transporting of crops to the homestead (FAO, 2011). He also stressed that decision making to sales of Irish Potato products are made by the male who is the head of the household when large proportions of the products are intended for sale. Division of labour between rural women and men still remain poorly understood (Cohen and Lemma, 2011). Okonkwo (1995) and FAO (2003) also reported that women play a central role in potato production, processing and marketing, contributing about 58 percent of the total agricultural labour in the southwest, 67 percent in the southeast and 58 percent in the south-south zones. They are also entirely responsible for processing Irish potato which provides them with additional income-earning opportunity and enhances their ability to contribute to household food security. However, in Nigeria women in Benue and Plateau states are deeply involved in land preparation, planting, harvest and processing (Akeredolu, 2009). He further confirmed that Plateau women are also noted for potato production which involves several processes of farm and domestic work such as harvesting, packing, bagging and peeling, respectively. Onwukeme (2001) also reported that agricultural production involves several processes of farm task such as land tilling, planting, weeding, fertilizer or manure application, harvesting, transporting and marketing.

Women play a significant role in smallholder agriculture, providing much of the labour required in agricultural production. Various studies indicate that women devoted more labour to the production of food crops, especially those intended for home consumption, than men. Apart from food production, women are often solely responsible for food processing, preservation, and storage (Das, and Ezekiel, 2007). Women are the major food providers and participants in the labour force within the communal mode of production. In Nigeria, women perform multiple roles for the survival of their homes and the nation. A significant number of Nigerian women are farmers, and they provide about 60 to 80 percent of the rural labour input (Rubin, 2012).

Irish Potato has been labelled as a female's crop, but there are conflicting views on this notion. Some researchers feel that the labelling of Irish Potato as a "women's crop" is misleading and a half truth (Schneider and Gugerty, 2010; Doss and Marris, 2001). United Nation (2010) reported that women are the main producers of Irish Potato as a food crop in Latin America; women decide which variety should be grown, where and when to plant the crop, while the men clear the fields. They are mainly involved in activities such as hoeing, weeding, harvesting, transporting, storing, processing, and marketing in addition to domestic work. Rural to urban migration of men into the cities in search of employment increased the labour burden on females who then became involved in land clearing and preparation tasks which was previously performed by men (WAP, 2006).

Several studies have identified numerous factors that influence the production level among male and female Irish potato farmers. These factors include age, education, farmers' experience, farm size and access to credits. Agobo *et al.* (2011) noted that some factors influencing level of Irish potato production include: age, household size, formal education as well as farming experience. Adebayo and Onu, (1999) also identified age, level of education, marital status, land ownership and access to credit as some of factors influencing production level. The level of education of the farmers is believed to influence use of improve technology in agricultural production; hence farm productivity (FAO, 2008). United Nation, (2010) reported that the economic efficiency level of farmers was significantly affected by farming experience, farm distance, education and extension services.

Rubin, (2012) reported that factors influencing level of production include age, educational status, marital status, income level and farming experience.

The importance of the assessment of male and female participation in Irish Potato production is very important because what is considered a normal activity or socially acceptable economic activity for different sexes varies from place to place and from culture to culture (Giovarelli, 2006). Olawoye (2005) observed that out of the 95 percent of the small-scale farmers in Nigeria who actually feed the nation, 65 percent of them are female. However, Akor (2006) 92 percent of the northern rural women gave farming as their primary and secondary occupation. The changing male and female roles and responsibilities in agriculture in Nigeria are traceable to the discovery of crude oil (FAO, 2008). The number of female involved in Irish Potato production has increased over the years as Irish Potato production provides increased employment opportunities for female. Plateau State is noted for Irish potato production and processing which involve land preparation, planting and harvesting and several processes of farm and domestic task as packing, peeling, washing, and bagging, respectively (Verma *et al.,* 2001).

Purpose of the study

Male and Female involvement and differences in levels of Irish potato production have not been studied in depth for the purpose of channelling development incentives, particularly support in terms of finances, access to land, technologies and agricultural extension packages in the study area. Agricultural production incentives appear to be distributed to the male at the expense of the female farmers (World Bank, 2010). In spite of the overwhelming evidence of female's roles and involvement in Irish potato production; it is most unfortunate that change agents or extension workers seem to side line female. In some situations, where male and female are on the fields, the land is considered 'his' not 'hers' (Olawoye, 2005). Lijongwa (2003) stated that female farmers had fewer opportunities than men by having less contact with extension officers who are mostly men and whose services are geared towards male farmers. Therefore, continual changes in men and women responsibilities in farming activities; call for an urgent and in depth study to fill the existing knowledge gap.

The specific objectives of the study include to:

i. describe and compare the socio-economic characteristics of male and female Irish potato farmers in the study area;
ii. identify the constraints faced by male and female Irish potato farmers in the study area.
iii. determine factors influencing potato output among male and female Irish potato farmers in the study area

Materials and Methods

The study was conducted in Jos-South Local Government area which is one of the seventeen Local Government Areas of Plateau State, Nigeria. It is located on latitude 08^0 44^1 and longitude 09^0 44^1 North (National Bureau of Statistic-NBS, 2011). It is made up of four districts; namely, Du, Gyel, Kuru and Vwang. The Local Government have its Headquarters in Bukuru. It's bounded by Barkin-Ladi Local Government Area to the South, Riyon Local Government Area to the South-West, Jos-East Local Government Area to the East and Bassa Local Government Area to the West. The Local Government has a projected population of 356,400 people as at 2010, with a land mass of 1,037 km^2 (NBS, 2011). Their major occupation is farming (i.e. crop and animal production) and it forms the bedrock of their livelihood.

Sources and types of data

Primary data used for the study were collected from the male and female Irish potato farmers of the study area. The primary data collected comprised of demographic information, access to productive resources and services, production as well as constraints facing the farmers.

Sampling technique and sample size

The four districts in Jos South Local Government Area, namely Du, Gyel, Kuru and Vwang were considered for the study. List of registered farmers was obtained from Department of Agriculture at the Local Government level which served as the sampling frame. Thereafter a random sampling technique was adopted to select 160 Irish Potato farmers in proportion to their number and gender in each district. It was determined using proportionate factor as adopted by Adebayo and Olayemi (2005).

The Formula is stated as: $s = \frac{e}{p} X \frac{q}{1} \ldots\ldots,1$

Where: S = Total number of respondents sampled; e = Population of farmers per district; P = Total population of farmers in the study area; Q = Total number of questionnaires that was administered

Table 1: Sampling of respondents

Wards	No of Male Farmers	No of Female Farmers	Sampled Male	Sampled Female
Du	178	223	18	22
Gyel	185	247	18	25
Kuru	169	218	17	22
Vwang	173	209	17	21
Total	**705**	**897**	**70**	**90**

Source: Field survey 2016

Method of data analysis

Both descriptive and inferential statistics were used to analyse the data. The descriptive statistics involved the use of frequencies, percentages, mean and ranking method was used to achieve objectives i and Likert scale was used to achieve objective ii while multiple regression analysis was used to achieve objective iii. T-test was used to compare male and female Irish potato farmers in the study area.

Model specification

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + u_1 \quad \ldots..3.2$$

Where: Y = Irish Potato Output in kg; x_1 = Age of the respondents (Years); x_2 = Level of education (Years spent in school); x_3 = Household size; x_4 = Years of experience in Irish potato farming; x_5 =Farm size (ha); x_6 = Number of extension contact; μ =Error term

Double log functional form was selected as the lead and is explicitly specified as:

$$Lny = \beta_0 + \beta_1 \ln x_1 - \beta_2 \ln x_2 - \beta_3 \ln x_3 + \beta_4 \ln x_4 - \beta_5 \ln x_5 + \beta_6 \ln x_6 + u_1$$

Results and Discussion

Demographic characteristics of the respondents

The demographic characteristics of the respondents are presented in Table 1. The variables considered were age, marital status, household, education and farming experience. The result revealed that majority (52.9%) of the male respondents were between 41-60 years of age, 35.7% were between 20-40 years and 11.5% were between the ages of 61-80. On the other hand, the age distribution of the female respondents is also presented in Table 2. The result revealed that majority (46.70%) of the female respondents were between 20-40 years, 43.30% were between 41-60 years and 10% were between the ages of 61-80. On the marital status of the respondents it shows that majority of the male respondents were married (77.1%) while 22.9% were single. Similarly, the distribution of the female respondents based on marital status as indicated that majority of them were married (77.80%) while 22.20% were single. The result on household size revealed that majority of the male respondents (55.80%) had between 6-10 persons in their household. The male farmers

that had household size of between 1-5 and 11-15 constituted 37.10% and 7.10%, respectively. The mean household size for male was 7.

On the other hand, the result for female farmers revealed that majority of them (53.40%) had between 6-10 persons in their households. The female farmers that had household size of 1-5 and 11-15 constituted 42.20% and 4.40%, respectively. The mean household size for female was 6. The two results exhibited similar trend, with majority of them having between 6-10 family size, and mean household size of 7 and 6 for male and female, respectively. Distribution of male farmers based on educational level revealed that majority (52.80%) of the respondents had attained primary education, while 21.40 and 25.70% attended secondary and tertiary education. Similarly, distribution of female farmers based on educational level revealed that majority (56.70%) of the female respondents had attained primary education, while 34.40 and 8.90% attended secondary and tertiary education, respectively. The distribution of the male respondents based on farming experience revealed that 20% of the male respondents had between 1 to 5 years of farming experience, 34.50% had 6 to 10 years of farming experience, 34.30% had 11 to 15 years of farming experience and 11.40% had above 15 years of farming experience. The mean farming experience for men was 11 years, which is enough to allow them take meaningful decision. On the other hand, the result of female farmers' experience showed that 25.6% of the female respondents had between 1 to 5 years of farming experience, 35.50% of them had between 6 to 10 years of farming experience, 28.40% had between 11 to 15 years of farming experience and 10% of the female respondents had above 15 years of farming experience.

Table 2: Distribution of respondents according to their socioeconomic characteristics

Characteristics	Male frequency	%	Female frequency	%
Age				
21-40	25	35.7	42	46.7
41-60	37	52.9	39	43.3
>60	8	11.5	9	10.0
Marital status				
Single	16	22.2	20	22.2
Married	54	77.1	70	77.8
Household size				
1-5	26	37.1	38	42
6-10	39	55.8	48	53.4
11-15	9	7.1	4	4.4
Education				
Primary	37	52.8	51	56.7
Secondary	15	21.4	31	34.4
Tertiary	18	25.7	8	8.9
Farming experience				
1-5	14	20	23	25.6
6-10	24	34.3	32	35.5
11-15	24	34.3	26	28.4
>16	8	11.4	9	10.0

Source: Field survey, 2016

Male and female contact with extension agents

Access to innovations, skills and modern inputs are linked mostly to extension services and training. The extension service could be through various methods such as, individual contact, group contact, focal persons or workshop. Other sources are through mass media; radio, television, newspaper, internet services etc (Ayanda and Alamu, 1991; Ifejika, 2012). Table 3 showed that 60% had 2 extension contacts, 21.40% of them had 1 contact, 14.3% had 3 contacts, 2.9% had 2 contacts and 1.4% had 5 contacts with extension agents during the year under review. On the other hand, the result for female farmers (Table 4.8) equally revealed that 22.20% of the female potato farmers in the study area had 1 extension contact within the year under review, while 56.70% had 2 contacts, 20% had 3 contacts and 1.10% had 6 contacts during the year under review. For both male and female, the majority had 2 contacts, though with varying degrees in favour of male farmers. This implies that the male potato farmers in the study area had more access to extension services. By implication therefore, this will afford them the opportunity to access technologies and inputs thereby enhancing their productivity. Equally, the contacts provide them with information on potato production technologies. This generally shows that there were limited extension activities in the study area. According to Kwarazuka (2010), extension services enable farmers to take up innovations, improve production, shows positive effects on knowledge and adoption.

Table 3: Distribution of respondents by extension contact

No of Contacts	Male		Female	
	Frequency	%	Frequency	%
1	15	21.4	20	22.2
2	42	60.0	51	56.7
3	10	14.3	18	20.0
4	2	2.9	0	0
5	1	1.4	0	0
6	0	0	1.1	1.1
Total	**70**	**100**	**90**	**100**
	Mean = 2		Mean = 2	

Source: Field survey, 2016

Table 4: Distribution of respondents according to constraints of production

Constraints	Mean score	Rank	Remark
Poor access to land	2.58	8	SP
poor access to capital	2.71	6	SP
High cost of labour	2.0	9	Problem
Shortage and untimely supply of inputs	2.65	7	SP
Problem of transportation	1.33	10	NP
Problem of Marketing of produce	1.32	11	NP
Problem of diseases	2.84	1	SP
Problem of pests	2.73	4	SP
Availability of extension agents	2.72	5	SP
Number of extension agents	2.72	5	SP
Cost of inputs	2.77	3	SP
Low number of extension visit	2.80	2	SP

Source: Field survey, 2016
2.5-3.0 - serious problem (SP);
2.0-2.49 - problem
< 2.0 – not a problem (NP)

Constraints faced by male and female Irish potato farmers

Several factors with varying degrees affect male and female Irish potato producers. Some of these factors include access to land, availability of extension agents, problem of pest, disease, etc.

The result in (Table 4) showed that disease was the most serious problem faced by both male and female Irish potato farmers in the study area with mean score of 2.84 and was ranked 1st. Low number of extension visit was also a serious problem with a mean score of 2.80 and was ranked 2nd. Cost of input was also a serious problem to the Irish potato farmers in the study area with a mean score of 2.77 and was ranked 3rd, problem of pest was ranked 4th with a mean score of 2.73 which was a serious problem to the male and female Irish potato farmers in the study area. Availability of extension agents and number of extension agents had mean score of 2.72 each and they were ranked 5th and they were both serious problems to the farmers. Poor access to capital was a serious

problem to the farmers and was ranked 6th with a mean score of 2.71. Poor access to land was ranked 8th with a mean score of 2.58 and was also a serious problem to the farmers. Shortage and untimely supply of input was ranked 7th with a mean score of 2.65. High cost of labour was ranked 9th with a mean score of 2.0 and it was considered as a problem by the farmers. Transportation was not a problem to both male and female Irish potato farmers in the study area, it was ranked 10th with a mean score of 1.33. Finally, marketing of produce was also not a problem to the farmers with a mean of 1.32; this is because there is always market for the commodity as it is only in few states in the north that potato is being produced due to its weather requirements.

Factors influencing potato output of male respondents

The determinants of potato output of the male respondents were evaluated using multiple regressions where four functional forms were tried and based on the econometric, economic and statistical criterion. Double log was chosen as the lead equation and the result is presented in Table 5. The coefficient of multiple determinations R square was 0.5569 meaning that 52% of the variations in potato output of the male respondents is explained by the explanatory variables included in the analysis. F-statistics was significant at 1% and revealed model fit. Farm size was significant at 1% with positive coefficient meaning that the more farmers increase their farm size the more their out output will increase. Similarly, level of education was significant at 1% with positive coefficient, meaning that the higher the level of education the more the output of the farmers. Extension contact was significant at 1% with positive coefficient meaning that contacts with extension agents would invariably influence their production output and vice versa. Adebayo and Onu (1999) also identified age, level of education, marital status, land ownership and access to credit as some of the factors influencing production level.

Table 5: Multiple regression analysis on male output (linear)

Variables	Parameters	Coefficient	Standard error	T-value
Constant		1251.002	554.697	2.26**
Age	X_1	1.228	2.445	0.50
Level of education	X_2	-52.523	15.009	3.50***
House hold size	X_3	.001	.004	0.34
Farm size	X_4	884.565	200.013	4.42***
Farming experience	X_5	-.336	3.326	0.52
Extension contacts	X_6	288.535	167.644	1.72*

Source*:* Computer output (SPSS) analysis, 2017 R^2 = 0.5569, Adjusted R^2 = 0.5147, F=13.20; ***, **, *, Represents values that are significant at 1, 5 and 10% levels, respectively

Table 6: Multiple regression analysis on female output (double log)

Variables	Parameters	Coefficient	Standard error	T-value
Constant		2.661	.334	7.95***
Age	X_1	.619	.160	3.85***
Level of education	X_2	-.028	.039	-0.72
House hold size	X_3	-.142	.059	-2.40**
Farm size	X_4	.355	.094	3.78***
Farming experience	X_5	-.336	.108	-3.09**
Extension contacts	X_6	.0125	.058	0.22

Source: Computer output (SPSS) Analysis (2017)

R^2= 0.4440, Adjusted R = 0.4038; F= 11.05***; ***, **, *, Represents values that are significant at 1, 5 and 10% levels, respectively

Factors influencing potato output of female respondents

The determinants of potato output of the female respondents were evaluated using multiple regressions where four functional forms were tried and based on the econometric, economic and statistical criterion. Double log was chosen as the lead equation and the result is presented in Table 6. The coefficient of multiple determinations R square was 0.4440 meaning that 44% of the variations in potato output of the female respondents is explained by the explanatory variables included in the analysis. F-statistics was significant at 1% and revealed model fit. Age is significant at 1% and has a positive influence on potato output for the female respondents. The implication is that the more the female farmers are ageing the more their output this is because farming was attributed as the occupation of male and old women in northern part of Nigeria because of religious and cultural affiliation. Household size was observed to have inverse relationship with the output. Farm size was also significant at 1% with positive coefficient meaning that the more farmers increase their farm size the more their out output. Farming experience was significant at 5% with negative coefficient meaning that farming experience of the female potato farmers has no relationship with their output in the study area. Adebayo and Onu (1999) also identified age, level of education, marital status, land ownership and access to credit as some of the factors influencing production level. According to Kwarazuka (2010) Extension services enable farmers to take up innovations, improve production, shows positive effects on knowledge and adoption.

Conclusion

Based on the findings the following conclusions were made; that both male and female were engaged in potato farming and participated actively in most production activities. Age, farm size, level of education and extension contact influenced Irish potato production. Both male and female farmers were faced with several constraints particularly in the areas of pest and diseases, poor extension service delivery, and high cost of inputs among others.

Recommendations

In line with findings of the study, the following recommendations were made:

i. Government should increase the number of extension agents and provide them with necessary facilities for effective discharge of their responsibilities, and should not be gender biased as both male and female are actively engaged in potato farming.
ii. Finally, government in collaboration with private companies should make inputs such as fertilizer, seeds, pesticides and herbicides available and timely accessible by the farmers in order to enhance farmers' productivity.
iii. Research institutes and other relevant authorities need to intensify their efforts in addressing the problem of potato pests and diseases, which would ensure profitability among the farmers.

Conflict of Interest

Authors declare that there is no conflict of interest related to this study.

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